# Crisis for Web

INGV – Istituto Nazionale di Geofisica e Vulcanologia
DPC – Dipartimento della Protezione Civile

## Accompanying Notes

F. Martinelli, C. Meletti

In March 2010 we released the Web version of the Crisis program, a probabilistic seismic hazard assessment (PSHA) tool.
The application was deployed at the URL http://crisis.mi.ingv.it/, however at the moment of writing it is not publicly available, waiting for DPC permission.
The new Web Application integrates the benefits offered by the web with the advanced features offered by the original program.

In details with the web application we got the following major achievements:
**Centralised distribution and deployment**: the application maintenance is performed only on the centralised Web server, releasing the users from technical activity. All users work on the same version.
**User platform independency**: while the web server still requires to run on a **Windows** based operating system (OS), users access the Crisis functionalities via standard Web browsers not constrained by the OS (e.g. **Mac, Unix, Linux**, …).
**Users identification and authorization**: the application includes an identification and authorization procedure to prevent malicious users from wasting of resources.
**Private area**: each user is granted a private folder where data files can be uploaded, and where the application leaves the results. Also files can be transferred to an FTP site.
**Common-shared area**: users may share their data within the community, especially useful when data file are huge, but also to easily amend bugs of previous data deliveries.
**Server background elaboration**: users elaboration requests require times beyond a normal web request-response cycle, and often beyond even a user session. The application keeps track of the originator of the request and return log information and resulting files to the private folder.
**Concurrent elaborations**: the application performs the elaborations concurrently, returning updated estimates of the expected time to complete. Concurrent elaboration prevents longer jobs to block other elaboration.

All the above web specific features comes together with the original and updated features present also in the stand alone version of Crisis:
**Occurrence probabilities instead of exceedance rates**
This choice allows the users to define non-Poissonian and complex earthquake occurrence models through a non parametric data model
Data are presented as the probabilities of occurrence of 1, 2, …, N events for each magnitude bin and fixed time frame

**Geometry features**

Areas and lines source types can be loaded from shapefiles

The multi-point source type was enhanced and now it is possible to associate to each point an arbitrarily oriented rupture plane, useful when working with ground motion prediction models (GMPM) that use distance metrics for which rupture size is relevant

**Seismicity features**

For Gutenberg-Richter and Characteristic models, magnitude exceedance rates are converted into occurrence probabilities assuming a Poisson process

It is now possible to use non-Poissonian occurrence models, where occurrence probabilities are explicitly given by the user in binary files

**Geometry – Seismicity – Attenuation combinations**

Not all the combinations of geometry-occurrence model-GMPM are possible. The table on the right shows the possible (because physically solid) combinations

**Rupture model**

A new option has been developed: if used, it produces the whole area or line breaks every time, regardless of earthquake magnitude

Intended to model characteristic earthquake (Poissonian or not Poissonian)

**Ground-Motion Prediction Model**

The GMPM architecture was completely reviewed, converting GMPMs into external software modules hooked to the application, each one with parameters specific to the model (values, choices, flags and external files); therefore additional custom GMPMs may be freely developed and integrated without having to recompile the core code

Among the GMPMs modules accompanying the release there is a new generalized model (GAF) intended to describe, in probabilistic terms, the ground motions computed by arbitrarily complex estimation models

The following GMPMs are currently implemented in Crisis Core:

- Abrahamson & Silva, 1997
- Akkar & Bommer, 2010
- Arroyo et al., 2009
- Boore & Atkinson, 2008
- Campbell & Bozorgnia, 2003
- Cauzzi & Faccioli, 2008
- Garcia et al., 2005
- Pasolini et al, 2008
- Sabetta & Pugliese, 1996
- Spudich et al., 1999
- Youngs et al., 1997

**Site effects**

CRISIS has now the ability to include site effects described with arbitrary spatial resolution in terms of amplification factors depending on site location, structural period and ground-motion level

**Logic tree**

The code has now enhanced capabilities to make logic-tree computations

**Disaggregation**

Disaggregation charts for M-R-epsilon combinations are available for any point of the map; the charts were fully redesigned to allow maximum flexibility over the selection of M-R-epsilon bins

**Help File**

The help is always available in different file formats, which allows for contextual help (in the desktop presentation layer) and web access (in the web presentation layer).

**Reference:**

Martinelli F. and Meletti C., 2009.
**CrisisWeb User Manual ver. 1.2.1**.
DPC Project S2, Deliverable D 1.2.b, 34 pp.

Martinelli F. and Meletti C., 2009.
**CrisisWeb Installation Manual ver. 1.2.1**.
DPC Project S2, Deliverable D 1.2.c, 6 pp.

For further queries please write to: martinelli@pi.ingv.it